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Checklist, endemism, English vernacular names and identification of the cicadas (Insecta, Hemiptera, Cicadidae) of KwaZulu-Natal, South Africa

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Abstract

Public understanding of the goals of applied biology and conservation is promoted by showcasing charismatic or significant organisms using vernacular names. Conservation activities in the province of KwaZulu-Natal, South Africa, are prioritising taxa that have high rates of provincial endemism, such as snails, earthworms, millipedes and cicadas. To assist wider public engagement in these activities, an assessment of endemism of the cicadas of KwaZulu-Natal is presented along with a dichotomous, 37-couplet key for the identification of males, based mainly on externally visible morphology and colouration. Standardised English vernacular names coined following a simple naming convention are proposed. Forty-two percent (16 out of 38) of the cicada species known from KwaZulu-Natal are endemic to the province. Photographs of some of the species are included to facilitate their identification. Photographs can be used for identification of various species providing that the diagnostic characters are visible in the photographs. For this purpose, photographs may have to be taken of hand-held individuals. Some of the endemic species are of particular concern for conservation because they are not known to occur in statutory protected areas or are only known from relatively small protected areas. The latter may not be able to ensure the long-term survival of the species. The rate and extent of loss of habitat outside protected areas is likely to be a grave threat to species that are not protected or that are inadequately conserved in statutory protected areas. The standardised vernacular names proposed here provide a tool for communicating provincial conservation plans and concerns with stakeholders in KwaZulu-Natal and for stimulating interest in cicadas amongst land users, environmental impact assessment practitioners, biologists, naturalists and citizen scientists.

Keywords
common names, key to species, diagnostic characters, conservation assessment, cicada photographs, vulnerability to extinction

Introduction

Professional biological conservation includes integrating the requirements of endemic species into conservation planning and environmental impact assessments (McGeoch et al. 2011) and these activities need to be communicated to other stakeholders to enhance their effectiveness. For instance, land transformation is probably the most important threat to biodiversity in KwaZulu-Natal, South Africa (and globally: Sánchez-Bayo and Wyckhuys 2019) and the need for communication about the matter is urgent because, while 53% of the total provincial landscape was still in a natural state in 2011 (Jewitt et al. 2015), this figure is projected to be only 45% by 2050 (Jewitt et al. 2015). Communication with the public to promote understanding of the goals of applied biology and conservation can be promoted by showcasing charismatic or significant organisms, particularly if these initiatives use vernacular names to which the audience can relate (Cockburn et al. 2014).

The system of universal scientific names endeavours to eliminate ambiguity about the identity of the organism being named (International Code of Zoological Nomenclature), a problem that can arise from regional synonyms (two names for the same organism, e.g. cicada and Christmas Beetle) and homonyms (two organisms with the same name, e.g. Christmas Beetle for both Chafer Beetles and cicadas). As they may be derived from Latin or foreign languages, appropriately Latinised (International Code of Zoological Nomenclature), scientific names may lack intuitive memorability, obvious meaning or even agreed pronunciation for both the public and some professionals in any field of biology, including conservation. The general public, in particular, are usually more willing to use vernacular names than scientific names. For this reason, conservation programmes in KwaZulu-Natal have published standard vernacular names for the province's species of snails, butterflies, millipedes, some forbhoppers, dragonflies and earthworms (Herbert and Kilburn 2004; Mecenero et al. 2013; Armstrong and Hamer 2015; Samways and Simaika 2016; Stals and Armstrong 2016; Armstrong and Nxele 2017). These names are often English neologisms, but work has started on cataloguing traditional African names in, amongst other languages, Zulu (Cockburn et al. 2014).

Internationally, the charismatic bugs known as cicadas in English and as isihlonono, isidlonono, inyekevu or isibawu in Zulu (Cockburn et al. 2014) and sonbesies in Afrikaans (Plant Protection Research Institute 1979) are well known to the general public owing to their shrill songs. They are iconic of the African bush, often adding atmosphere in films, literature and other cultural capital. However, most of the species of cicada in KwaZulu-Natal lack colloquial or vernacular names. The vulnerability to extinction of the cicadas that are currently considered endemic to KwaZulu-Natal needs to be communicated to the general public and incorporated into conservation

planning and environmental impact assessments. The list of English names provided here can also provide the basis for a colloquial folk taxonomy of vernacular names of cicada genera and species elsewhere in South Africa.

Material and methods

Diversity and endemism

Occurrence data from the collections of the Africa Museum (Tervuren), the Albany Museum (Makhanda [Grahamstown]), the Ditsong National Museum of Natural History (Pretoria), the Durban Natural Science Museum (Durban), the Iziko South African Museum (Cape Town), the KwaZulu-Natal Museum (Pietermaritzburg), the South African National Collection of Insects (Pretoria), the Natural History Museum of Zimbabwe (Bulawayo), the Natural History Museum (London), the Swedish Museum of Natural History (Stockholm), the National Museum of Namibia (Windhoek), donations from many members of the public and a spectrum of published literature, were collated by MHV and supplemented by the Ezemvelo KZN Wildlife Biodiversity Database. These allowed the compilation of a checklist of species known from KwaZulu-Natal and an assessment of which species are likely to be endemic to that province.

Naming convention

A fundamental guideline to coining standardised scientific names for organisms is articulated in Recommendation 25C of the International Code of Zoological Nomenclature: "… ensure that they are chosen with their subsequent users in mind and that, as far as possible, they are appropriate, compact, euphonious, memorable and do not cause offence" (International Code of Zoological Nomenclature). Related species are grouped into genera. The name of the genus is commonly a noun while the species-specific part of the species name is usually a qualifier, like an adjective or a noun in the genitive case. In this way, the entire name is essentially a much-abbreviated description of the organism. While some species-specific parts of names refer to the place of discovery or a person associated with the species, others may refer to morphological, biological or behavioural traits. Names that help to identify the organism tend to be easier to remember. These principles can also be applied to the coining of new vernacular names.

Some vernacular names already exist in folk taxonomies and published literature. If appropriate, these should be used because those organisms are sufficiently familiar and significant to have attracted public attention. Additionally, there is no advantage to creating a synonym. However, homonyms and clearly inapplicable vernacular names should be replaced by appropriate new names. Folk taxonomies contain many names that are equivalent to scientific taxa such as families (e.g. cicada), but seldom recognise the individual species comprising these groups. In these cases, vernacular neologisms

can be formed by qualifying the collective name with a suitable translation of the species-specific part of the scientific name. Some scientific names of genera are derived from vernacular words, e.g. *Ibonikawhite*, *Stagira*, *Munza* and *Monomatapa*. Reciprocally, where a particular taxon, such as a genus or family, lacks a vernacular name, one can be formed from the scientific name. Translation has the advantage of coordinating continuity between vernacular and scientific names. If a robust and stable phylogenetic classification of a group has been established (e.g. Marshall et al. 2018), the opportunity to coin vernacular names is also an opportunity to co-ordinate the folk taxonomy with the hierarchy of relationships that is inherent in the scientific classification.

New vernacular names for taxa such as families, genera and species can also be formed from diagnostic or characteristic features of the taxon under consideration. Examples of these features include morphology, colouration, calls or song and ecological relationships.

We have used these principles in the creation of English names for cicada species occurring in KwaZulu-Natal. These and other naming conventions (e.g. Wilson and Cole 2000; Grubb 2006) have been used in compiling, amongst others, the World Bird List of the International Ornithological Committee (http://www.worldbirdnames.org), *Common Names of Mammals of the World* (Wilson and Cole 2000), the Entomological Society of America's Common Names of Insects Database (https://www.entsoc.org/common-names) and the database of vernacular names in both French and English for insects and other arthropods of the Common Names Committee of the Canadian Entomological Society (http://esc-sec.ca/entomology-resources/common-names/).

Systematics

Based on the species list, relevant taxonomic literature (e.g. Distant 1906; Villet 1987, 1989, 1994, 1997; Villet and Reavell 1989; Marshall et al. 2018) and experience, a taxonomic key to adult males of the subfamilies, genera and species of cicadas occurring in KwaZulu-Natal was drawn up. The identification of many species of cicadas relies on characteristics of the males' sound-producing organs and genitalia. As a result, identification of females relies on comparison of, for instance, wing patterns and body size with those of identified males. To assist this comparison, photographs of the females of several species are presented.

Results

Faunal list and endemism

Over 7800 records of cicadas occurring in southern Africa were gathered, including over 800 records of cicadas from at least 368 unique locations in KwaZulu-Natal. Following the classification of Marshall et al. (2018), these records represented 38 species from 15 genera, six tribes and three subfamilies (Table 1).

Most of the larger-bodied cicadas (Cicadinae) are found in several provinces of South Africa, but are endemic to the country (Table 1). They are strong fliers and females disperse well, but the species tend to be specific in their habitat or plant associations. Males attract females through singing. The species of Lamotialnini (Cicadettinae) are not endemic to South Africa, fly well and have no obvious plant associations. The species of Cicadettini, Malagasiini and Parnisini (all Cicadettinae) are generally endemic to the country, fly less robustly and are often grassland-associated. Two species, in the genus *Taipinga*, are endemic to KwaZulu-Natal. The Tettigomyiini (Tettigomyiinae) is represented in KwaZulu-Natal by the southern African genus *Stagira*, which is comprised of 39 species (Villet 1997). Most of the *Stagira* species are endemic to eastern South Africa and are weak fliers. Each species occupies a specific habitat (forest or forest margins or grassland or savannah or thicket). Several species of *Stagira* have brachypterous females, which severely limits the dispersal abilities of the species and thus promotes narrow-range endemism. Fourteen of the fifteen species of *Stagira* occurring in KwaZulu-Natal are endemic to the province (Table 1).

Vernacular names

To date, very few vernacular names for African cicadas have been recognised and they all equate to Cicadidae, i.e. the taxonomic rank of family in scientific nomenclature. Cicadas collectively have been referred to as isibawu or inyenzane in Xhosa (Mkize et al. 2003); isibawu, inyekevu, isidlonono or isihlonono in Zulu (Cockburn et al. 2014); khentšherere, sentšherere, lentsenene, ntšherere, ntsekenene, kherurubele or serurubele in the Hananwa, Kgaga, Lobedu and Moletši dialects of Northern Sotho (Mathobela and Villet unpublished data); and sonbesies, boomsangertjies, boomsingertjies, doringbesies, nuwe-jaarsbesies, somerbesies and sonroepertjies in Afrikaans (Plant Protection Research Institute 1979). Inyenzane alludes to lonesomeness, connoting the mournful sounds that the large-bodied cicadine cicadas produce (Mkize et al. 2003) and sonbesie means sun bug, referring to cicadas' tendency to sing in the sunniest parts of the day and the year, hence the misappropriated English name Christmas Beetle.

The inappropriate name Christmas Beetle, which is used for cicadas (which are bugs) in parts of South Africa and elsewhere, is a homonym that is also and more properly used for some local ruteline and melolonthine Chafer Beetles. Christmas Beetle has also recently been used for eumolpine Leaf Beetles by Holm (2017). Other common names for cicadas are the inappropriate Christmas Bees, Christmas Cicadas and Christmas Singers (Plant Protection Research Institute 1979). However, some cicada species are not present as adults in December and therefore cannot be appropriately called Christmas Cicadas or Christmas Singers. These examples of inappropriate names and ambiguity about the identity of the organism being named support arguments for standardising vernacular names. The Ezemvelo KZN Wildlife Biodiversity Database has used vernacular names internally for some time.

Picker et al. (2002) published some English neologisms for South African cicadas that occur in KwaZulu-Natal. We did not use some of these for the following reasons.

Table 1. Checklist of cicada species occurring in KwaZulu-Natal, South Africa, with proposed vernacular names. Species endemic to KwaZulu-Natal are set in bold print. KZN = KwaZulu-Natal, RSA = Republic of South Africa.

Scientific Name	Endemism	English Name
Subfamily TETTIGOMYIINAE Distant, 1905	Africa	Obscure Cicadas (universally diagnostic characters lacking)
Tribe TETTIGOMYIINI Distant, 1905	Africa	Pygmy Bladder Cicadas
Genus *Stagira* Stål, 1861	Southern Africa	Redeye Cicadas
***Stagira dracomontana* Villet, 1997**	**KZN**	Small Drakensberg Redeye Cicada (Fig. 1)
***Stagira dracomontanoides* Villet, 1997**	**KZN**	Drakensberg Redeye Cicada
***Stagira empangeniensis* Villet, 1997**	**KZN**	Empangeni Redeye Cicada (Fig. 2)
***Stagira eshowiensis* Villet, 1997**	**KZN**	Eshowe Redeye Cicada
***Stagira microcephala* (Walker, 1850)**	**KZN**	Smallhead Redeye Cicada (Fig. 3)
***Stagira nasuta* Villet, 1997**	**KZN**	Pointyhead Redeye Cicada
***Stagira natalensis* Villet, 1997**	**KZN**	Savanna Redeye Cicada (Fig. 4)
***Stagira ngomiensis* Villet, 1997**	**KZN**	Ngome Redeye Cicada (Fig. 5)
***Stagira nkandlhaensis* Villet, 1997**	**KZN**	Nkandla Redeye Cicada (Fig. 6)
Stagira pondoensis Villet, 1997	RSA	Pondoland Redeye Cicada (Fig. 7)
***Stagira pseudaethlius* Villet, 1997**	**KZN**	False Guineagrass Redeye Cicada
***Stagira purpurea* Villet, 1997**	**KZN**	Purple Redeye Cicada (Fig. 8)
***Stagira virescens* Kirkaldy, 1909**	**KZN**	Guineagrass Redeye Cicada (Fig. 9)
***Stagira xenomorpha* Villet, 1997**	**KZN**	Strange Redeye Cicada
***Stagira zuluensis* Villet, 1997**	**KZN**	Zulu Redeye Cicada
Tribe MALAGASIINI Marshall et al., 2018	Africa	Madagascar Cicadas (notably includes Malagasy species)
Genus *Quintilia* (Stål, 1866)	RSA	Karoo Cicadas
Quintilia sp.	RSA	Pied Cicada (Fig. 10)
Genus *Nyara* Villet, 1999	RSA	Fainting Cicadas (feign death)
Nyara thanatotica Villet, 1999	RSA	Drab Fainting Cicada
Subfamily CICADINAE Latreille, 1802	Most of World	Baffled Cicadas (a baffle covering each sound-producing organ)
Tribe PLATYPLEURINI Schmidt, 1918	Africa and Asia	Broadwing Cicadas
Genus *Pycna* Amyot & Audinet-Serville, 1843	Africa	Large Tree Cicadas
Pycna natalensis Distant, 1905	RSA	Large Woodland Cicada
Pycna semiclara (Germar, 1834)	RSA	Whining Forest Cicada (Fig. 11)
Genus *Kongota* Distant, 1904	RSA	Greenwing Cicadas (predominant hindwing colour)
Kongota punctigera (Walker, 1850)	RSA	Greenwing Cicada (Fig. 12)
Genus *Munza* Distant, 1904	Africa	Broadborder Cicadas (broad hindwing margins)
Munza basimacula (Walker, 1850)	Southern Africa	Small Broadborder Cicada
Genus *Brevisiana* Boulard	Africa	Thorntree Cicadas (thorntree hostplants)
Brevisiana brevis (Walker, 1850)	Southern Africa	Shrill Thorntree Cicada (Fig. 13)
Genus *Oxypleura* Amyot & Audinet-Serville, 1843	Africa	Sharpcollar Cicadas (laterally-pointed thoracic collar)
Oxypleura lenihani Boulard, 1985	Southern Africa	Coastal Sharpcollar Cicada
Genus *Platypleura* Amyot & Audinet-Serville, 1843	Africa	Orangewing Cicadas (predominant hindwing colour)
Platypleura argentata Villet, 1987	RSA	Coastal Milkwood Orangewing Cicada
Platypleura deusta (Thunberg, 1822)	RSA	Ouhout Orangewing Cicada (Fig. 14)
Platypleura divisa (Germar, 1834)	RSA	Centrestripe Orangewing Cicada
Platypleura haglundi (Stål, 1866)	Southern Africa	Variable Orangewing Cicada
Platypleura maytenophila Villet, 1987	RSA	Spikethorn Orangewing Cicada
Platypleura wahlbergi (Stål, 1855)	RSA	Zigzag Orangewing Cicada
Platypleura zuluensis Villet, 1987	RSA	Dune Koko Orangewing Cicada (Fig. 15)
Genus *Tugelana* Distant, 1912	Southern Africa	Maputaland Orangewing Cicadas
Tugelana butleri Distant, 1912	Southern Africa	Maputaland Orangewing Cicada (Fig. 16)
Subfamily CICADETTINAE Buckton, 1890	Most of World	Largeclasper Cicadas (relatively large male mating claspers)
Tribe CICADETTINI Buckton, 1890	Most of World	True Largeclasper Cicadas
Genus *Melampsalta* Kolenati, 1857	Unknown	Black-and-Brown Grassland Cicadas
Melampsalta leucoptera (Germar, 1830)	RSA	Whitewing Grassland Cicada (Fig. 17)

Scientific Name	Endemism	English Name
Melampsalta limitata (Walker, 1852)	RSA	Clearwing Grassland Cicada
Tribe PARNISINI Distant, 1905	Unknown	Short Abdomen Cicadas
Genus *Zouga* Distant, 1906	Africa	Narrowwing Cicadas
Zouga sp.	?RSA	Dark Narrowwing Cicada
Genus *Taipinga* Distant, 1905	Southern Africa	Groovehead Cicadas
***Taipinga luctuosa* (Stål, 1855)**	**KZN**	Dismal Cicada
***Taipinga albivenosa* (Walker, 1858)**	**KZN**	Whitevein Cicada
Tribe LAMOTIALNINI Boulard,1976	Unknown	Widehead Cicadas (eyes laterally protruding forming a broad head)
Genus *Trismarcha* Karsch, 1891	Africa	Smoothfront Widehead Cicadas (top and front of head continuous)
Trismarcha sirius (Distant, 1899)	Southern Africa	Small Widehead Cicada
Genus *Monomatapa* Distant, 1897	Africa	Anglefront Widehead Cicadas (top of head meets the front at an angle)
Monomatapa insignis Distant, 1897	Southern Africa	Large Widehead Cicada

Figure 1. Small Drakensberg Redeye Cicada *Stagira dracomontana* Villet, 1997 male.

The name Axe-head used for *Oxypleura lenihani* could be used for most species in the genera *Oxypleura*, *Ioba* and *Strumoseura* as they have characteristically pointed lateral pronotal lobes. The name "Orange-wing" was used for two species of *Platypleura* cicadas and is therefore a homonym. However, we have used Orangewing Cicadas for the genus *Platypleura* as a whole. The name "Green-wings" was used for the genus *Stagira*. Although many of the *Stagira* species are green-bodied, their wing membranes are generally colourless as mature adults, with the exception of one species that has distinctly green-tinted forewing membranes. We retained the name Karoo Cicadas for the genus *Quintilia*.

Our proposed list of English names of cicadas occurring in KwaZulu-Natal is presented in Table 1. Some of these vernacular names are translations of specific epithets, combined with a general genus-level name. Other names emphasise readily visible morphological characteristics and identifying ecological relationships of the species. A couple emphasise the species-specific call together with an ecological relationship. The names employed not only capture the taxonomy, but also emphasise obvious features that allow the cicadas to be more easily identified and appreciated.

Figure 2. Empangeni Redeye Cicada *Stagira empangeniensis* Villet, 1997 male; (top) mature male, (bottom) teneral male.

Identification

Cicadas are best located through the calling of the males. Calls of male cicadas differ between species (Villet 1988, 1992). Certain species can be identified easily by their calls alone. No sound library for all of the cicadas in KwaZulu-Natal is currently available, but digital recordings made by MHV have been lodged at the Natural History Museum, London. The males of certain species form calling aggregations. Once

Figure 3. Smallhead Redeye Cicada *Stagira microcephala* (Walker, 1850) male; (top) mature male, (bottom) teneral male.

located and once the observer is familiar with the local cicada fauna, some cicadas in KwaZulu-Natal can be easily identified by general appearance, particularly in the hand and with the use of a hand lens (e.g. the species of Cicadinae). Good quality photographs of the dorsal surface of these species can be used to identify them, provided that the necessary forewings, hindwings and abdomen are displayed (i.e. photographs may need to be taken of hand-held individuals). The taxonomic key below indicates the diagnostic features used to identify the cicadas to species that may need to be visible in photographs. Another adjunct to the identification of cicada species that utilise only one species or genus of hostplant is the identity of the plant species on which the male is singing. The habitat in which the cicada was found should also be noted.

The *Stagira* species with red colouration can be identified by a combination of general appearance and locality. For these species, georeferenced photographs of the whole animal may be used for identification. The other *Stagira* species would require good

Figure 4. Savanna Redeye Cicada *Stagira natalensis* Villet, 1997 male and female; (top) mature male, (bottom) female.

Figure 5. Ngome Redeye Cicada *Stagira ngomiensis* Villet, 1997 male; (top) mature male, (bottom) teneral male.

Figure 6. Nkandla Redeye Cicada *Stagira nkandlhaensis* Villet, 1997 male.

Figure 7. Pondoland Redeye Cicada *Stagira pondoensis* Villet, 1997 teneral male.

Figure 8. Purple Redeye Cicada *Stagira purpurea* Villet, 1997 male and female; (top) mature male, (bottom left) teneral male, (bottom right) female.

Figure 9. Guineagrass Redeye Cicada *Stagira virescens* Kirkaldy, 1909 male; (top) mature male, (bottom) teneral male.

macrophotography of the various diagnostic features (see the taxonomic key below) to be identifiable from photographs. The habitat and locality where the *Stagira* cicada was photographed would be important confirmatory information.

Adult males of all of the species can be identified with the following taxonomic key. Many of the features mentioned are visible to the naked eye or with the use of a hand lens, but the use of a microscope is required to see microscopic hairs and certain structures of the genitalia of the *Stagira* species. Females' opercula are smaller and their external genitalia simpler in comparison with males of the same species and they lack timbals (e.g. compare male and female in Figure 4).

The nymphs of cicadas tend to live underground, are seldom seen and are very poorly known in South Africa (Midgley et al. 2013), even though this stage of the life cycle may be the most long-lived. There is no comprehensive key to the nymphs of cicadas in South Africa (Bouwer et al. 2013; Midgley et al. 2013).

Figure 10. Pied Cicada *Quintilia* sp. male and female; (top) mature male, (bottom) teneral female.

Figure 11. Whining Forest Cicada *Pycna semiclara* (Germar, 1834) male

Figure 12. Greenwing Cicada *Kongota punctigera* (Walker, 1850) male.

Figure 13. Shrill Thorntree Cicada *Brevisiana brevis* (Walker, 1850) male.

Figure 14. Ouhout Orangewing Cicada *Platypleura deusta* (Germar, 1834) male.

Figure 15. Dune Koko Orangewing Cicada *Platypleura zuluensis* Villet, 1987 male.

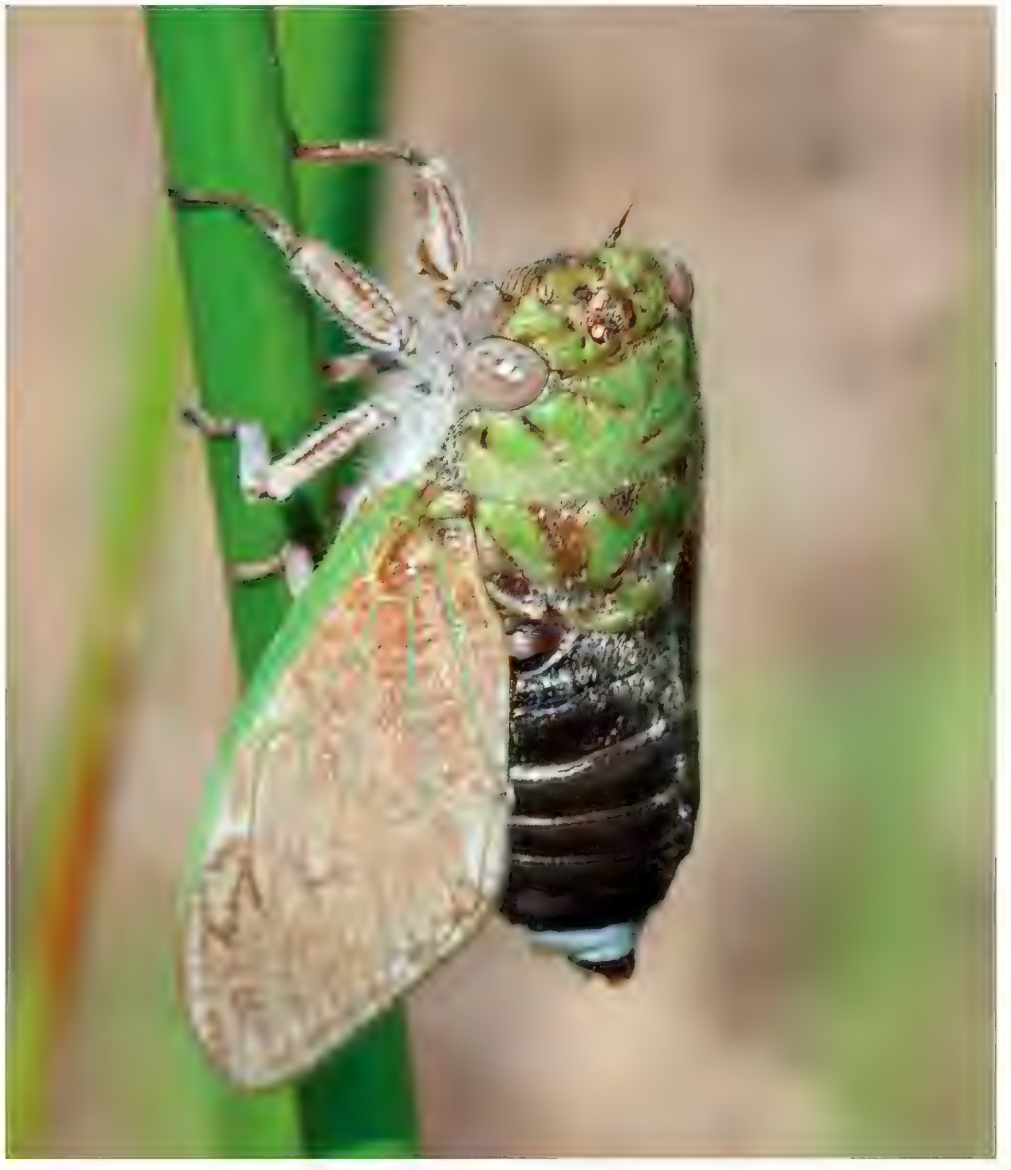

Figure 16. Maputaland Orangewing Cicada *Tugelana butleri* Distant, 1912 male.

Figure 17. Whitewing Grassland Cicada *Melampsalta leucoptera* (Germar, 1830) male.

Key to adult male cicadas of KwaZulu-Natal

1 Abdomen forming about half of total body length and with a lateral flap covering the timbals; thorax with pronotum bearing distinct lateral lobes and metanotum hidden by mesonotum; forewing membrane usually opaque; largest spine on forefemur lying flat against the femur (Fig. 18) Cicadinae: Platypleurini..... **3**

– Abdomen forming about two-thirds or more of total body length; timbals exposed, not hidden by a flap; thorax with pronotum lacking lateral lobes and metanotum at least partially visible behind mesonotum; forewing membrane more or less transparent; largest spine on forefemur standing more or less perpendicular to the femur (Fig. 19) **2**

2 Claspers present (Fig. 20); forewing (except *Taipinga*) with median and anterior cubital veins sharing a common stem, forming a Y on the posterodistal corner of the basal cell (Fig. 21) Cicadettinae..... **16**

– Claspers absent; forewing with median and anterior cubital veins distinctly separated at their bases (Fig. 18) Tettigomyiinae **22**

3 Hindwing with marginal membrane unusually wide, about 20% of hindwing length; small species, forewing length 16–17 mm ..... ***Munza basimacula***

– Hindwing with marginal membrane narrow (Fig. 22), less than 10% of hindwing length; usually much larger species **4**

4 Membranes of both wings largely transparent, practically unpigmented..... **5**

– Membranes of forewing and at least half of hindwing pigmented..... **6**

5 Larger species (forewing length 33–40 mm), pronotum with large, pointed lateral lobes; forewing veins not spotted..... ***Oxypleura lenihani***

– Smaller species (forewing length 27–31 mm), pronotum with smaller, rounded lateral lobes; forewing veins usually with white spots..... ***Brevisiana brevis***

6 Hindwing largely greenish, without a black margin.....**7**
– Hindwing mostly orange, with a black margin *Platypleura* and *Tugelana*.....**9**
7 Smaller species (forewing length 26–28 mm); hindwing entirely pigmented; costal margin of forewing strongly dilated at base..... ***Kongota punctigera***
– Larger species (forewing length > 35 mm); hindwing transparent at apex; costal margin of forewing not strongly dilated at base (Fig. 18) *Pycna*.....**8**
8 Frons not deeply indented above clypeus ..... ***Pycna natalensis***
– Frons deeply indented above clypeus (Fig. 18) ..... ***Pycna semiclara***
9 Opercula (Fig. 19) not overlapping; forewing silvery; white band around tip of abdomen entire (Fig. 18); forewing length 27–31 mm.... ***Platypleura argentata***
– Opercula overlapping; forewing not silvery; white band around tip of abdomen either entire or divided longitudinally **10**
10 Crossveins (Fig. 18) of hindwing blackened; associated with the plant *Gymnosporia heterophylla* (Anglestem Spikethorn).....**11**
– Crossveins of hindwing not blackened; not associated with Anglestem Spikethorn plants **12**
11 Body with brownish markings; black margin on hindwing well developed; forewing length 27–30 mm..... ***Platypleura divisa***
– Body with green markings; black margin on hindwing weakly developed; forewing length 28–31 mm..... ***Platypleura maytenophila***
12 Smaller species (forewing length < 23 mm) **13**
– Larger species (forewing length > 25 mm).....**15**
13 Hindwing with dark markings not restricted to margin; forewing with relatively rounded angles, costal margin weakly curved at base.....**14**
– Hindwing with black pigmentation restricted to margin; forewing quite angular, costal margin strongly curved at base..... ***Platypleura haglundi***
14 Forewing without transparent areas and plainly pigmented; apical cells of hindwing darkened in their centres like wing margin ..... ***Tugelana butleri***
– Forewing with transparent areas near the margin and usually variegated; apical cells of hindwing orange in their centres, leaving a dark zigzag marking along the discal crossveins ..... ***Platypleura wahlbergi***
15 Pronotum lacking black median line; associated with the plant *Maytenus procumbens* (Dune Koko Tree) in coastal areas..... ***Platypleura zuluensis***
– Pronotum with distinct, black median line; associated with the plant *Leucosidea sericea* (Ouhout) in montane areas ..... ***Platypleura deusta***
16 Abdomen pale brownish with black markings Cicadettini: *Melampsalta*.....**18**
– Abdomen more plainly coloured, green, reddish, purple or darker brown **17**
17 Eyes not distinctly projecting beyond anterior angles of pronotum (Fig. 18) Parnisini.....**19**
– Eyes distinctly projecting beyond anterior angles of pronotum Lamotialnini.....**21**
18 Forewings somewhat opaque, whitish, pigmented around some veins; abdomen somewhat inflated..... ***Melampsalta leucoptera***
– Forewings hyaline, not pigmented around veins; abdomen relatively slim ..... ***Melampsalta limitata***

19 Hindwings with six apical cells (Fig. 22) ..... ***Zouga* sp.**
– Hindwings with five apical cells *Taipinga* **20**
20 Larger species, body ~17 mm long; wing veins brown..... ***Taipinga luctuosa***
– Smaller species, body ~12 mm long; wing veins white ..... ***Taipinga albivenosa***
21 Smaller species, forewing length < 30 mm..... ***Trismarcha sirius***
– Larger species, forewing length > 35 mm ..... ***Monomatapa insignis***
22 Abdominal tergites smoothly arched, without a median ridge Malagasiini **23**
– Abdominal tergites with a median longitudinal ridge (Fig. 19) Tettigomyiini: *Stagira*..... **24**
23 Forewings ovoid, somewhat rounded, about twice as long as wide... ***Quintilia* sp.**
– Forewings narrowly ellipsoid, somewhat pointed, about three times as long as wide..... ***Nyara thanatotica***
24 Dorsum of pygofer (Fig. 19) bearing a distinct spine or tubercle (Fig. 23)..... **25**
– Dorsum of pygofer smooth or humped (Fig. 23), but not bearing a spine or tubercle..... **27**
25 Larger species, forewing length > 14 mm; costal vein red in mature specimens... ..... ***Stagira pondoensis***
– Smaller species, forewing length < 13 mm; costal vein green. **26**
26 Timbal with four ribs (Fig. 19) ..... ***Stagira virescens***
– Timbal with five ribs..... ***Stagira pseudaethlius***
27 Abdominal tergites bearing at least some pale, minute hairs. Generally medium-to-large sized [wing length 13–23 mm, females sometimes smaller] and/or with some red pigment **28**
– Abdominal tergites without any pale hairs, but minute, usually dense, black hairs may be present. Generally small-to-medium sized [wing length 10–16 mm], green species **34**
28 Urite spatulate (Fig. 24) with slightly membraneous margins, but no lateral points near the mid-length. Outline of clypeus pointed (Fig. 25)..... ..... ***Stagira xenomorpha***
– Urite not spatulate, margins of urite drawn into points near the mid-length (Fig. 24) **29**
29 Points on lateral margins of urite not hooked or recurved (Fig. 24). Timbal with four ribs; clypeal profile straight (Fig. 26); no dark spot on first sternite; Ngome Forest region ..... ***Stagira ngomiensis***
– Points on lateral margins of urite recurved or hooked (Fig. 24) **30**
30 Body generally with red or purple pigmentation; apical margin of urite sinuous; aedeagal keel ending in a vane (Fig. 27) **31**
– Body green, never with red or purple pigmentation; apical margin of urite smoothly semi-circular (Fig. 24); aedeagal keel ending in crenellations (Fig. 27)..... **32**
31 Timbal with four ribs; medial corner of operculum angular; escarpment region northwest of Pietermaritzburg..... ***Stagira purpurea***
– Timbal with three ribs; medial corner of operculum rounded; Nkandla Forest region ..... ***Stagira nkandlhaensis***

32 Urite shield-like (Fig. 24), the lateral projections obtuse, each forming less than a quarter of the total width of the urite; aedeagal keel ending in an irregular vane (Fig. 27) ..... ***Stagira eshowiensis***

– Urite axe-like (Fig. 24), the lateral projections acute, each forming about a quarter of the total width of the urite; aedeagal keel irregularly crenelated (Fig. 27)..... **33**

33 Head rounded (Fig. 25); timbal with five ribs ..... ***Stagira microcephala***

– Head triangular (Fig. 25); timbal with four ribs ..... ***Stagira nasuta***

34 Urite diamond-shaped (Fig. 24), the points on the lateral margins not hooked or recurved..... ***Stagira empangeniensis***

– Urite shaped like arrowheads (Fig. 24), the points on the lateral margins hooked or recurved..... **35**

35 Lateral lobes of pygofer parallel in ventral view (Fig. 28), not projecting laterally from pygofer **36**

– Lateral lobes of pygofer diverging laterally in ventral view (Fig. 28), projecting laterally from pygofer..... **37**

36 Clypeal profile convex and inflated (Fig. 26) ..... ***Stagira natalensis***

– Clypeal profile straight (Fig. 26), not convex and inflated..... ***Stagira zuluensis***

37 Length of forewing > 14.5 mm; apical cell of forewing rectangular ..... ***Stagira dracomontanoides***

– Length of forewing < 13.5 mm; apical cell of forewing trapezoidal (Fig. 22) ..... ***Stagira dracomontana***

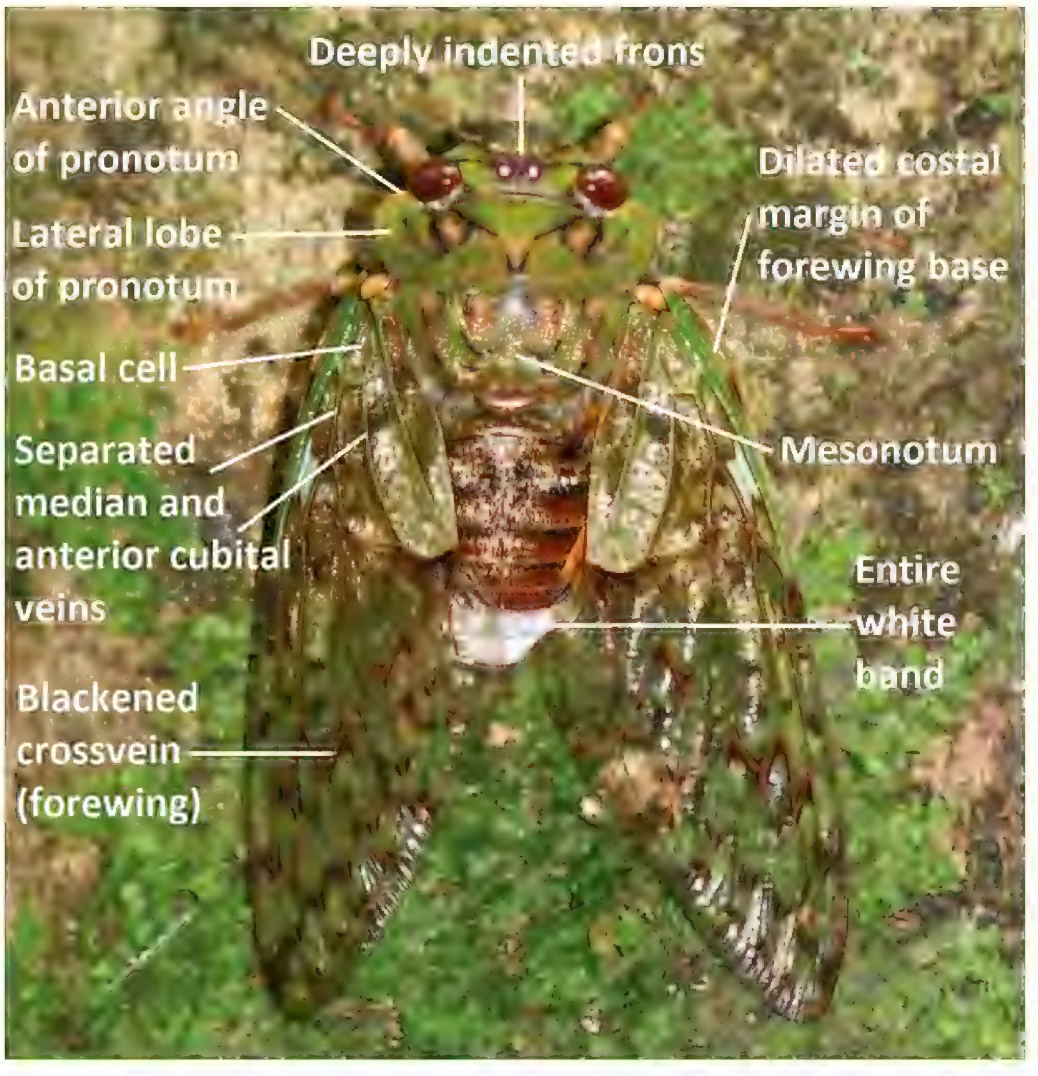

Figure 18. Some characters used in the taxonomic key (illustrated is a species in the subfamily Cicadinae).

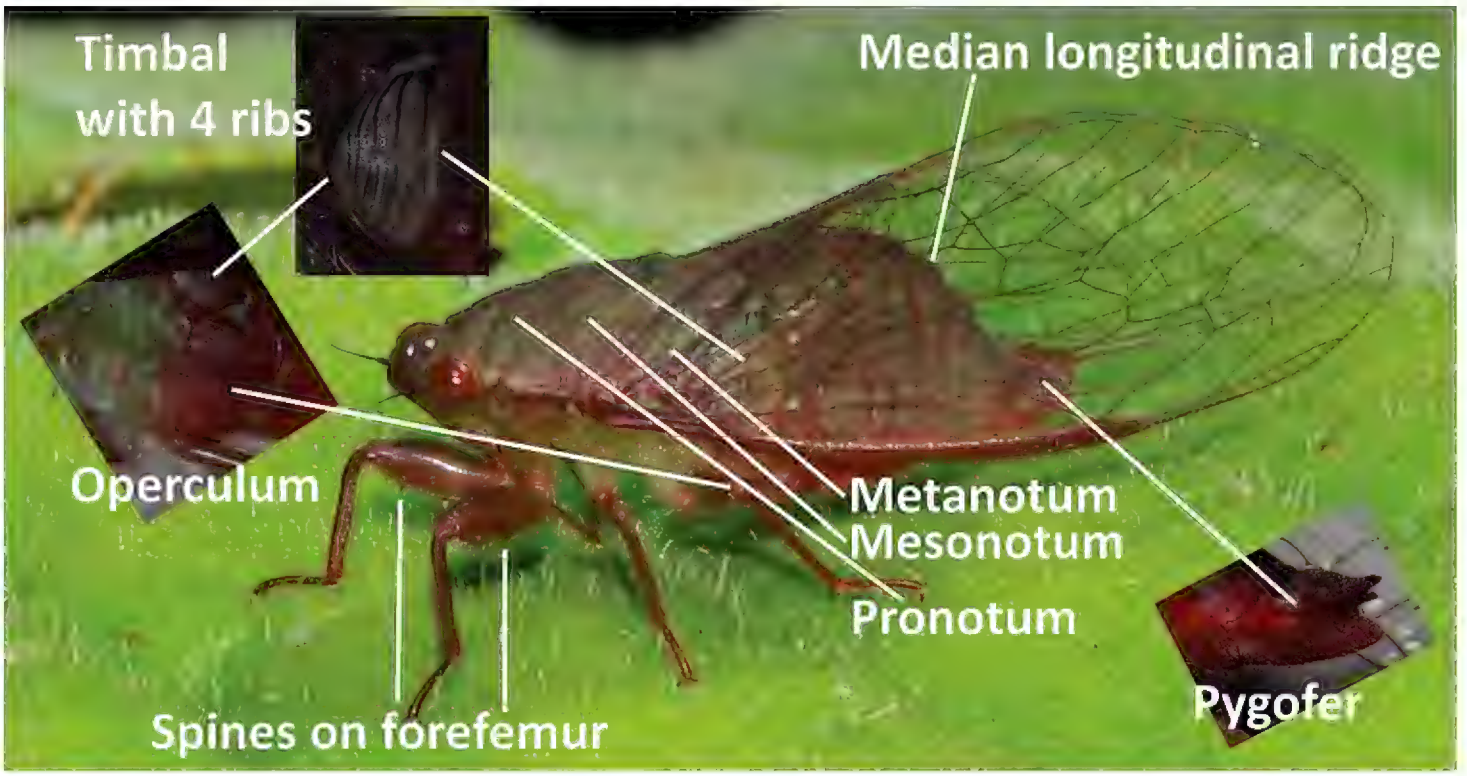

Figure 19. More characters used in the taxonomic key (illustrated is a species in the subfamily Tettigomyiinae).

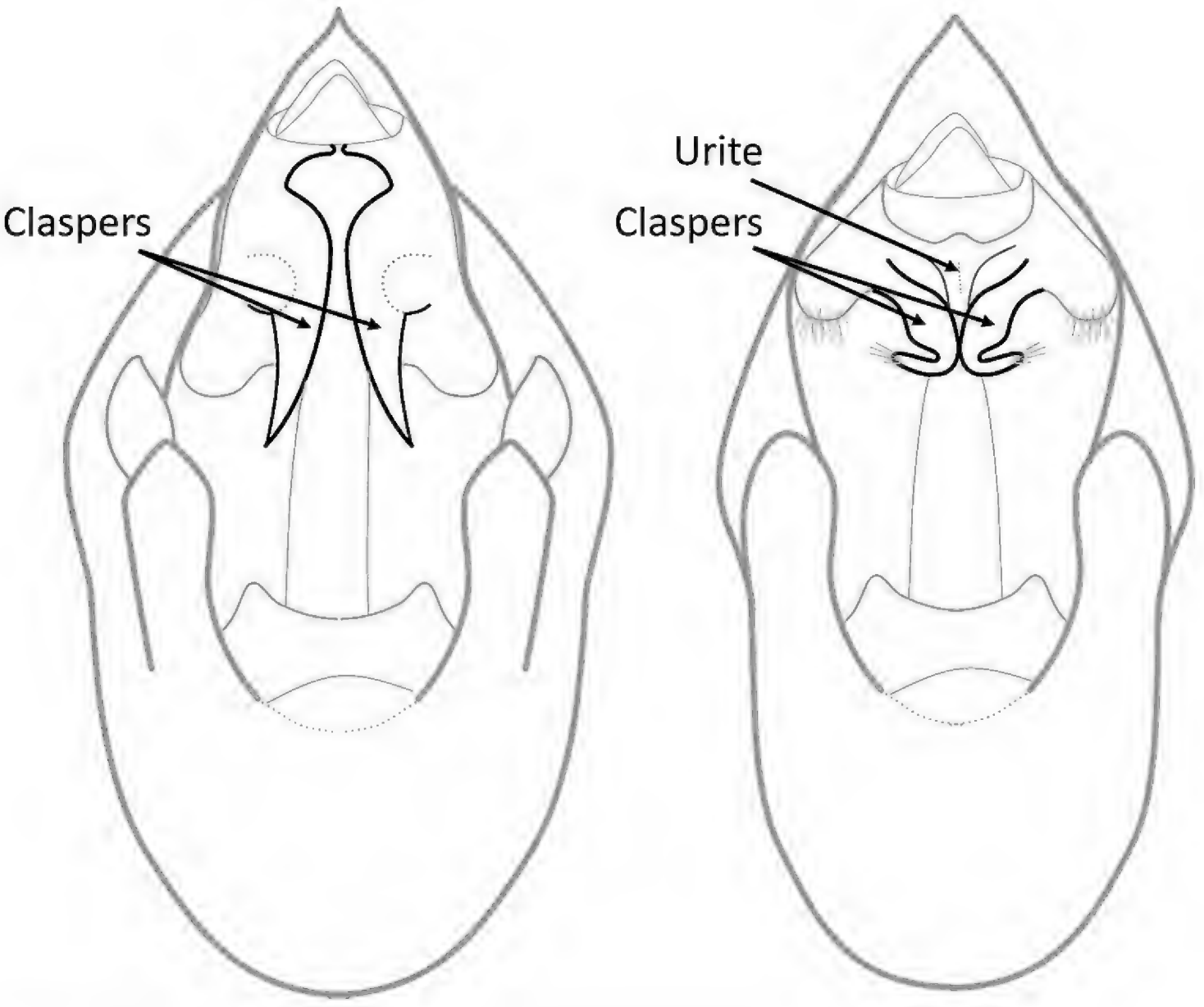

Figure 20. Variation in shape of claspers (subfamily Cicadettinae).

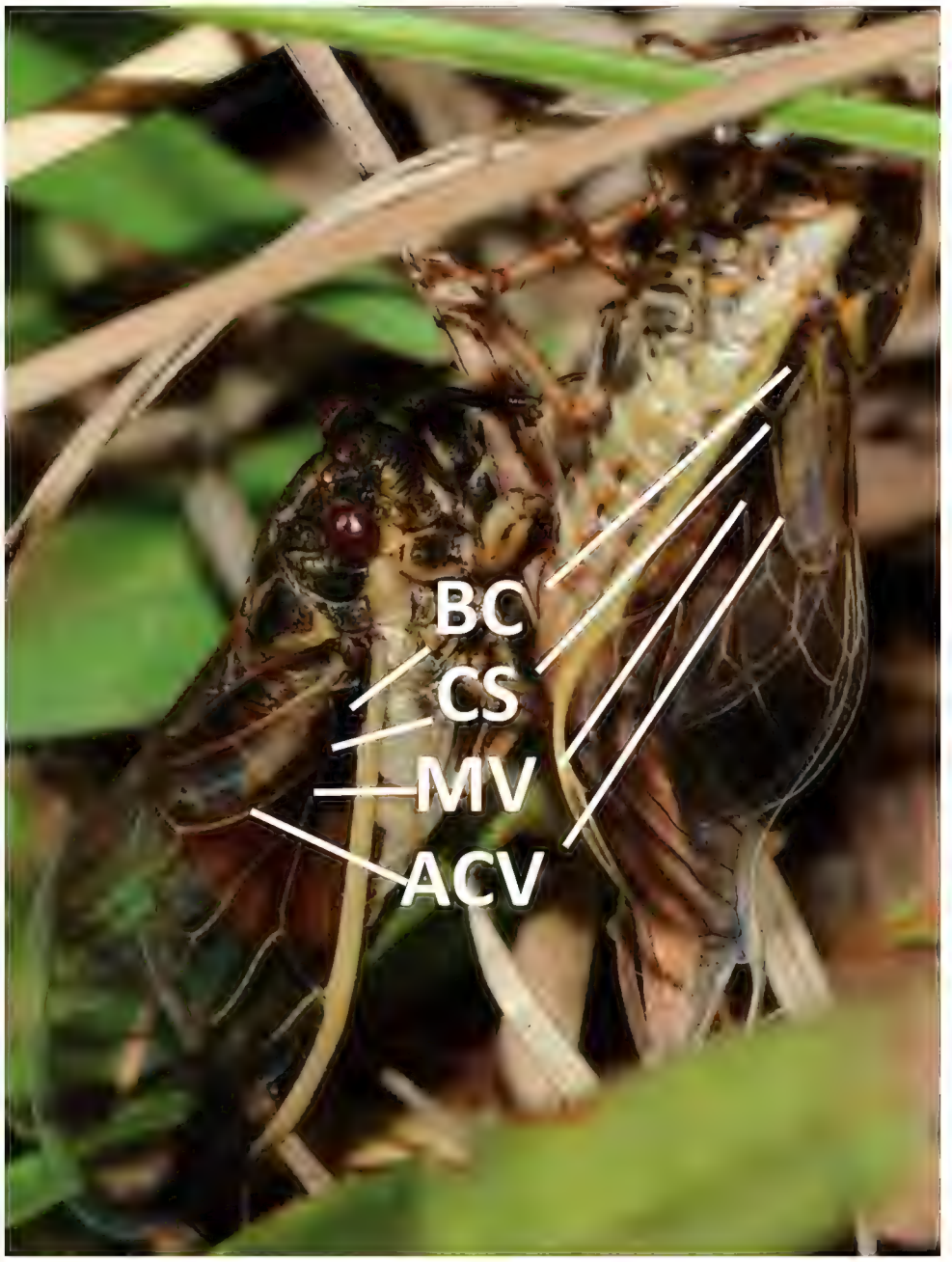

Figure 21. Vein arrangement characteristic of the subfamily Cicadettinae. BC = basal cell, CS = common stem, MV = median vein, ACV = anterior cubital vein.

Figure 22. Some wing characters used in the taxonomic key.

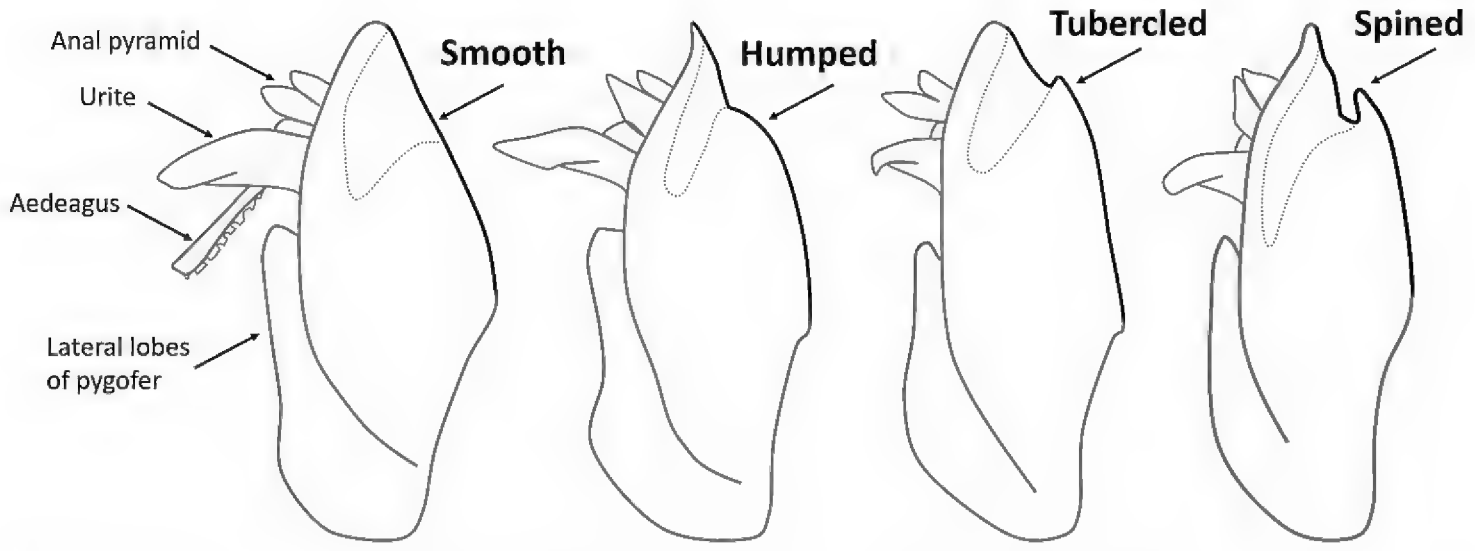

Figure 23. Variation in the shape of the dorsum of the pygofer in the genus *Stagira*, viewed from the left side. The structures represented in grey on the ventral sides are the anal pyramid and urite, with the aedeagus represented once.

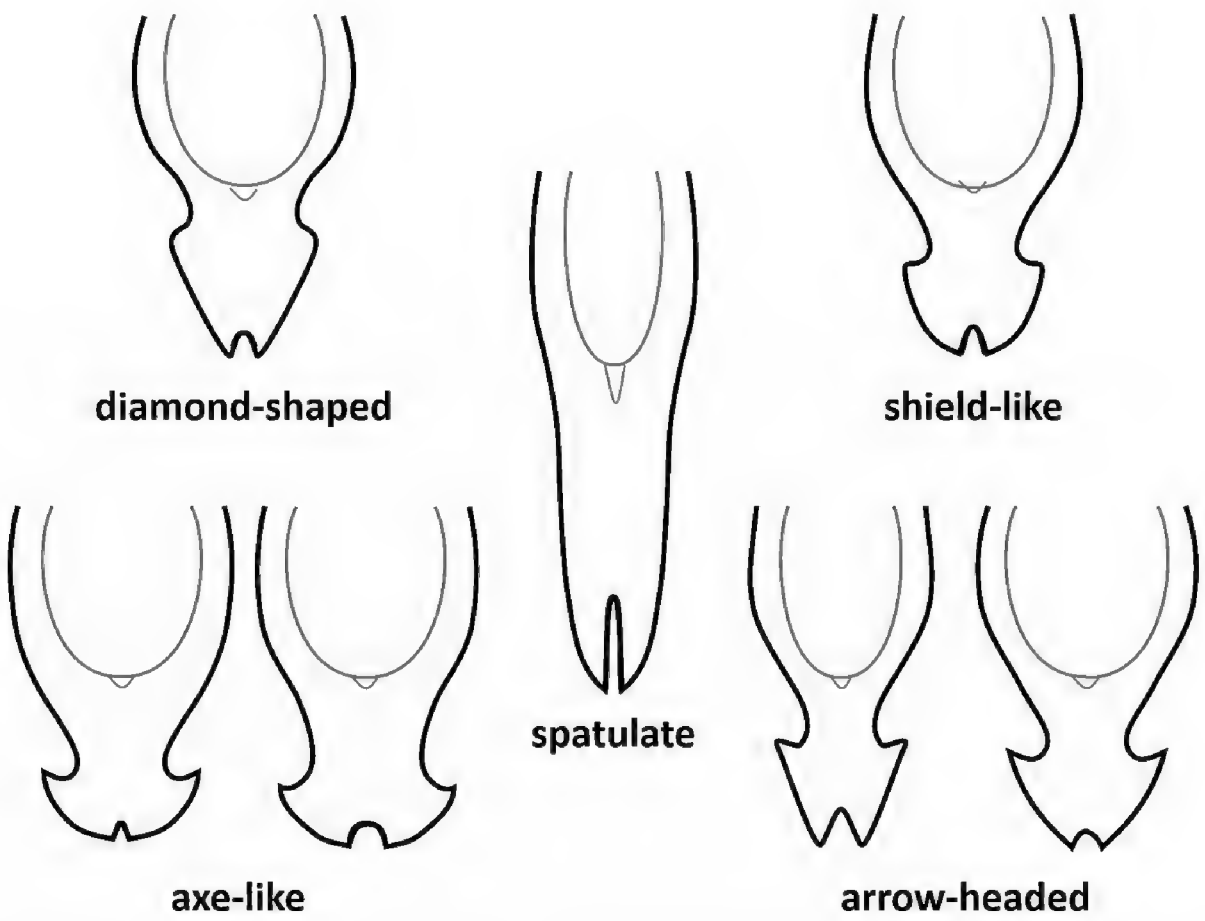

Figure 24. Variation in the shape of the urite in posterior view, in the genus *Stagira*. The structure represented in grey is the base of the anal pyramid.

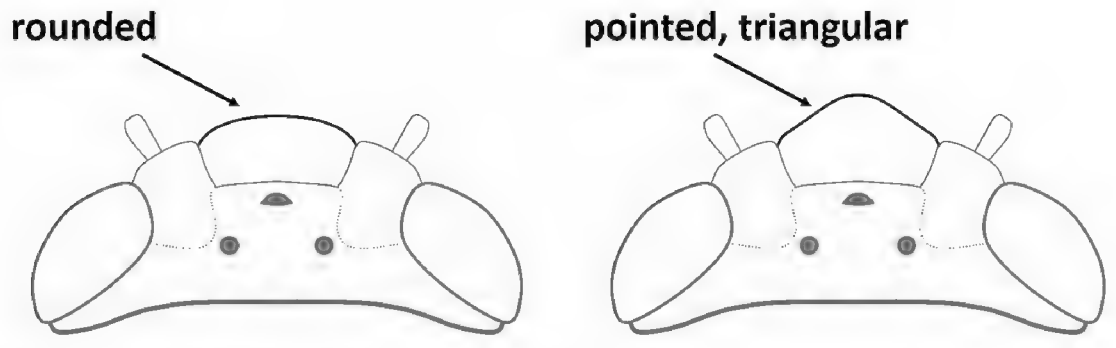

Figure 25. Variation in the shape of the head in dorsal view.

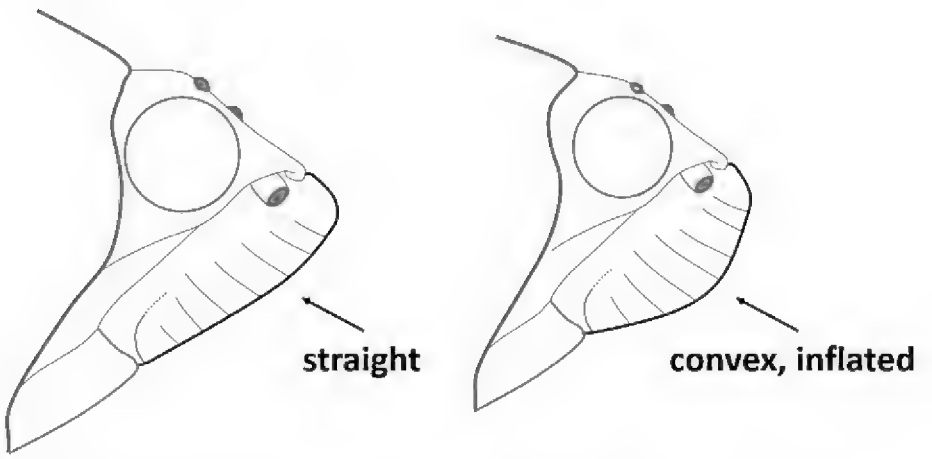

Figure 26. Variation in the shape of the clypeal profile, viewed from the right.

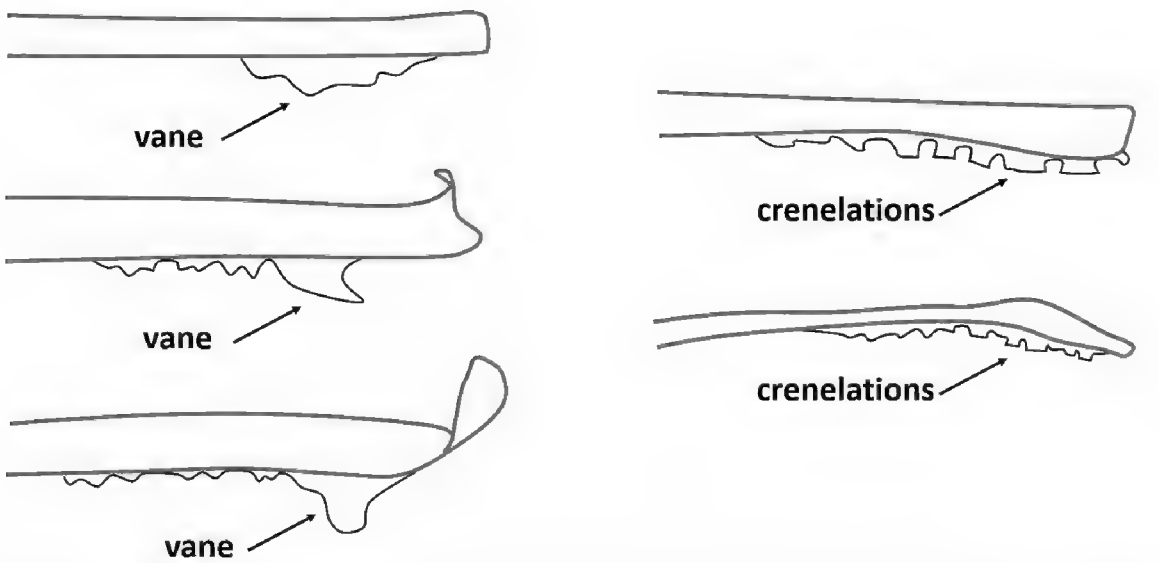

Figure 27. Variation in the shape of the keel of the aedeagus in the genus *Stagira*. The aedeagus is represented in grey in right lateral view.

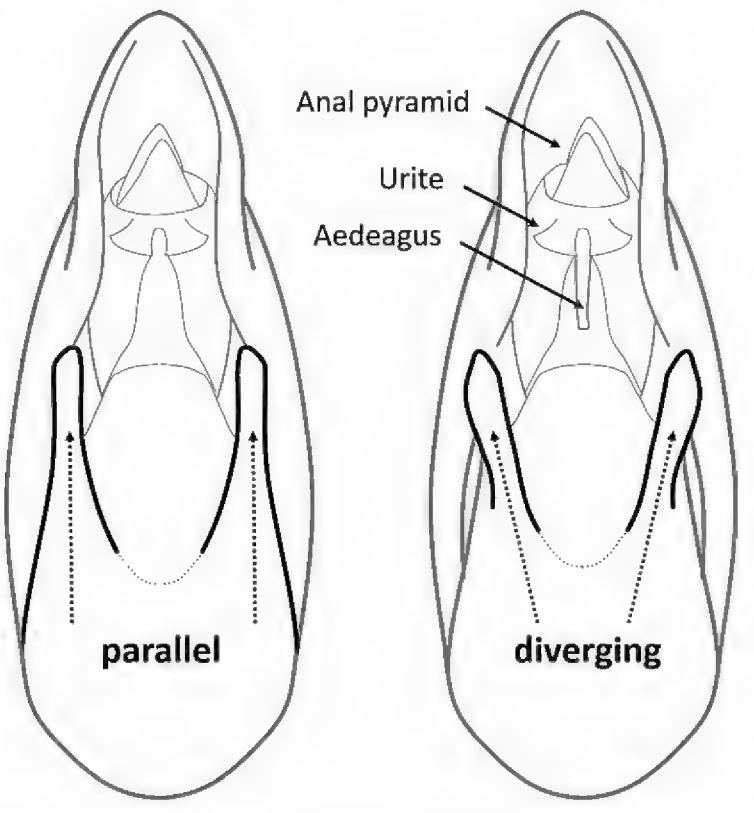

Figure 28. Variation in the orientation of the lateral lobes of the pygofer in ventral view, in the genus *Stagira*. The structures represented in grey on the ventral sides are the anal pyramid and urite, with the aedeagus represented once.

Discussion and conclusions

Forty-two percent of the cicada species of KwaZulu-Natal are endemic to the province (Table 1). The majority of the cicada species that are endemic to KwaZulu-Natal are species of *Stagira* and they inhabit a spectrum of habitats from grassland to forest (Villet 1997). These cicadas therefore qualify for particular attention in provincial conservation planning and environmental impact assessments (McGeoch et al. 2011). Some of the endemic species are of high concern for conservation because they are not known to occur in protected areas (e.g. False Guineagrass Redeye Cicada *Stagira pseudaethlius*, Strange Redeye Cicada *S. xenomorpha*, Whitevein Cicada *Taipinga albivenosa*). The sizes of the protected areas in which some other species occur are likely to be too small to ensure the long-term survival of the species (e.g. Empangeni Redeye Cicada *S. empangeniensis*, Purple Redeye Cicada *S. purpurea*). The amount of habitat available for endemic species in larger protected areas is currently unknown and the long-term survival of some of these species may depend on adequate areas of suitable habitat remaining outside these protected areas.

The rate of land transformation that is occurring outside protected areas in the province is high; the recorded average rate of loss of natural habitat between 1994 and 2011 was 1.2% per annum (Jewitt et al. 2015). Forty-six percent of the province had its natural vegetation removed by human activities by 2011 (Jewitt et al. 2015). Therefore endemic species that are not adequately protected in protected areas may face the threat of removal of substantial areas of their remaining habitat in the future. Some protected areas are also affected by anthropogenic disturbances, such as grazing by cattle and removal of trees and other plants, which may also affect the habitat of cicadas.

All of the cicada species endemic to KwaZulu-Natal, for which accurate distribution information is available, are included in the current systematic conservation plan for KwaZulu-Natal (Ezemvelo KZN Wildlife 2010). However, the extent of occurrence of each of these cicada species is as yet unknown and, for several species, accurate distribution records are unavailable or are few. Much work remains to be done on the basic biology and ecology of the endemic species. The standardised vernacular names proposed here provide a tool for communicating provincial conservation plans with stakeholders in KwaZulu-Natal. We hope that providing more intuitive access to these charismatic insects will stimulate interest in cicadas amongst land users, environmental impact assessment practitioners, biologists, naturalists and citizen scientists, to the benefit of the conservation of cicadas in KwaZulu-Natal.

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